NASA SBIR/STTR Technologies

FULLY AUTOMATED, LOSS AND CONTAMINATION MINIMIZED MICROFLUIDIC RNA PROFILING CARD

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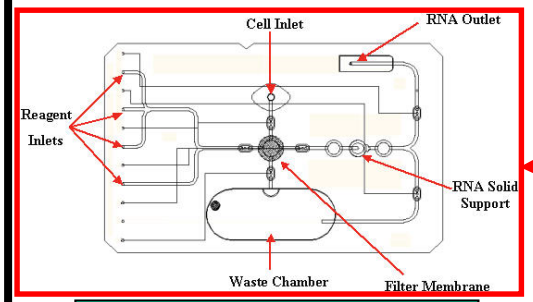
Need:

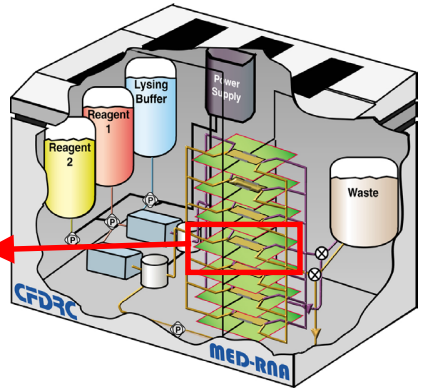
Differential gene expression / RNA profiling is the critical step in characterizing normal vs. diseased state. Current RNA preparation methods are tedious, non-robust, and require constant user intervention to avoid problems with RNA loss due to RNase contamination

Objective:

Develop a microfluidics based miniaturized (card-sized) platform that can fully automate RNA extraction (MED-RNA). Starting from whole cells in a culture medium, the device will lyse, extract, elute and freeze/store RNA content for later analysis. Losses and contamination will be minimized as a byproduct of the miniaturization and automation



Microfluidic cartridge for cell lysis and RNA capture & storage



MED-RNA concept For RNA extraction

Approach:

- Microfabrication and optimized design for full automation (walk away) of RNA extraction with minimal reagents
- Microfluidic principles to guide sample/reagent distribution and process steps
- Multiphysics simulation-based design of key components ensuring success
- Plastic card based fabrication technology for low-cost, high-volume production

Subcontractors/Partners:

Micronics Corp., WA

Leveraging:

- CFDRC - World leader in microfluidic system design/software
- Micronics - Demonstrated capabilities in lysis and RNA analysis

Schedule and Deliverables:

- Phase I
  - Simulation-driven detailed design of MED-RNA lab card
  - Demonstration Lysing and Extraction; Downselection
  - Conceptual design of stacked, integrated system
- Phase II:
  - Design, fabricate and demonstrate integrated lab card
  - System design and integration (with NASA expt)
  - Demonstration with other cell lines

NASA & Commercial Applications:

- Greatly advances ISS and MARS exploration capabilities; Reduces astronaut time, increases samples flown
- Extremely valuable in pharmaceutical/drug development process, clinical and pre-clinical research etc.